

WHAT IS CLAIMED IS:

1 1. A rolling element for a continuously variable  
 2 transmission, including input and output disks and a  
 3 power roller interposed between the input and output  
 4 disks, the power roller including an inner race, an outer  
 5 race and a plurality of rolling members interposed  
 6 between the inner and outer races, the input and output  
 7 disks and the inner race having rolling contact surfaces  
 8 coming into rolling contact with each other via  
 9 lubricating oil, the inner and outer races having rolling  
 10 contact surfaces coming into rolling contact with the  
 11 rolling members via lubricating oil, the rolling element  
 12 comprising:  
 13 a nickel-based coat formed on at least one of the  
 14 rolling contact surfaces, the nickel-based coat having a  
 15 thickness ranging from 0.1 to 20  $\mu\text{m}$ .

1 2. The rolling element as claimed in claim 1, wherein  
 2 the thickness of the nickel-based coat is in a range of  
 3 0.1 to 10  $\mu\text{m}$ .

1 3. The rolling element as claimed in claim 1, wherein  
 2 the thickness of the nickel-based coat is in a range of  
 3 0.5 to 7  $\mu\text{m}$ .

1 4. The rolling element as claimed in claim 1, wherein  
 2 the nickel-based coat has a surface roughness of not more  
 3 than 0.1 in terms of arithmetical mean roughness  $R_a$ .

1 5. The rolling element as claimed in claim 1, wherein a  
 2 base metal of the rolling element which is obtained after  
 3 forming the nickel-based coat thereon has a surface  
 4 roughness of not more than 0.1 in terms of arithmetical  
 5 mean roughness  $R_a$  at the rolling contact surface.

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1 6. The rolling element as claimed in claim 1, wherein  
2 the nickel-based coat has a Vickers hardness of not less  
3 than Hv 300.

1 7. The rolling element as claimed in claim 1, wherein  
2 the nickel-based coat has a Vickers hardness ranging from  
3 Hv 300 to Hv 700.

1 8. The rolling element as claimed in claim 1, wherein  
2 the nickel-based coat contains phosphorus P in an amount  
3 of 0.1 to 12 mass percent.

1 9. The rolling element as claimed in claim 1, wherein  
2 the rolling contact surface comprises a bearing surface  
3 of each of the inner and outer races which is in contact  
4 with the rolling members, the nickel-based coat being  
5 formed on the bearing surface of each of the inner and  
6 outer races.

1 10. The rolling element as claimed in claim 1, wherein  
2 the rolling contact surface comprises a traction surface  
3 of the inner race which is in contact with the input and  
4 output disks, the nickel-based coat being formed on the  
5 traction surface of the inner race.

1 11. The rolling element as claimed in claim 1, wherein  
2 the rolling contact surface comprises a second traction  
3 surface of each of the input and output disks which is in  
4 contact with the inner race of the power roller, the  
5 nickel-based coat being formed on the second traction  
6 surface.

1 12. A continuously variable transmission, comprising:  
2 input and output disks including a pair of first  
3 rolling contact surfaces opposed to each other, the input

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4 and output disks being arranged in a coaxial and spaced  
5 relation to each other;

6 a power roller interposed between the input and  
7 output disks, the power roller comprising:

8 a plurality of rolling members;

9 an inner race including a second rolling  
10 contact surface coming into rolling contact with  
11 the pair of first rolling contact surfaces via  
12 lubricating oil; and

13 an outer race opposed to the inner race,  
14 the inner and outer races including a pair of  
15 third rolling contact surfaces coming into  
16 rolling contact with the plurality of rolling  
17 members via lubricating oil, and

18 a nickel-based coat formed on at least one selected  
19 from the pair of first rolling contact surfaces, the  
20 second rolling contact surface and the pair of third  
21 rolling contact surfaces, the nickel-based coat having a  
22 thickness ranging from 0.1 to 20  $\mu\text{m}$ .

1 13. The continuously variable transmission as claimed in  
2 claim 12, wherein the thickness of the nickel-based coat  
3 is in a range of 0.1 to 10  $\mu\text{m}$ .

1 14. The continuously variable transmission as claimed in  
2 claim 12, wherein the thickness of the nickel-based coat  
3 is in a range of 0.5 to 7  $\mu\text{m}$ .

1 15. The continuously variable transmission as claimed in  
2 claim 12, wherein the nickel-based coat has a surface  
3 roughness of not more than 0.1 in terms of arithmetical  
4 mean roughness Ra.

1 16. The continuously variable transmission as claimed in  
2 claim 12, wherein a base metal of the rolling element  
3 which is obtained after forming the nickel-based coat

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4 thereon has a surface roughness of not more than 0.1 in  
5 terms of arithmetical mean roughness Ra at the rolling  
6 contact surface.

1 17. The continuously variable transmission as claimed in  
2 claim 12, wherein the nickel-based coat has a Vickers  
3 hardness of not less than Hv 300.

1 18. The continuously variable transmission as claimed in  
2 claim 12, wherein the nickel-based coat has a Vickers  
3 hardness ranging from Hv 300 to Hv 700.

1 19. The continuously variable transmission as claimed in  
2 claim 12, wherein the nickel-based coat contains  
3 phosphorus in an amount of 0.1 to 12 mass percent.

1 20. The continuously variable transmission as claimed in  
2 claim 12, wherein the nickel-based coat is formed on the  
3 pair of third rolling contact surfaces of the inner and  
4 outer races of the power roller.

1 21. The continuously variable transmission as claimed in  
2 claim 12, wherein the nickel-based coat is formed on the  
3 second rolling contact surface of the inner race of the  
4 power roller.

1 22. The continuously variable transmission as claimed in  
2 claim 12, wherein the nickel-based coat is formed on the  
3 pair of first rolling contact surfaces of the input and  
4 output disks.

1 23. A process for producing a rolling element for a  
2 continuously variable transmission, including input and  
3 output disks and a power roller interposed between the  
4 input and output disks, the power roller including an  
5 inner race, an outer race and a plurality of rolling

6 members interposed between the inner and outer races, the  
 7 input and output disks and the inner race having rolling  
 8 contact surfaces coming into rolling contact with each  
 9 other via lubricating oil, the inner and outer races  
 10 having rolling contact surfaces coming into rolling  
 11 contact with the rolling members via lubricating oil, the  
 12 rolling element including a nickel-based coat formed on  
 13 at least one of the rolling contact surfaces, the process  
 14 comprising:

15       subjecting the at least one of the rolling contact  
 16 surfaces to one of strike plating, electroplating,  
 17 combination of strike plating and electroplating, and  
 18 combination of strike plating and electroless plating to  
 19 form the nickel-based coat thereon.

1   24. The process as claimed in claim 23, wherein the  
 2 strike plating is conducted at a current density of  $0.1 \times$   
 3  $10^2$  to  $10 \times 10^2$  A/m<sup>2</sup>.

1   25. The process as claimed in claim 24, wherein the  
 2 strike plating is conducted at a current density of  $0.1 \times$   
 3  $10^2$  to  $5 \times 10^2$  A/m<sup>2</sup>.

1   26. The process as claimed in claim 23, wherein the  
 2 electroplating is conducted at a current density of  $0.1 \times$   
 3  $10^2$  to  $10 \times 10^2$  A/m<sup>2</sup>.

1   27. The process as claimed in claim 23, further  
 2 comprising subjecting the at least one of the rolling  
 3 contact surfaces to baking at a temperature of not more  
 4 than 200°C after the one of strike plating,  
 5 electroplating, combination of strike plating and  
 6 electroplating, and combination of strike plating and  
 7 electroless plating.

1 28. The process as claimed in claim 23, further  
2 comprising subjecting a workpiece to forging and rough  
3 machining to form a preform, subjecting the preform to  
4 surface-hardening, subjecting the surface-hardened  
5 preform to grinding and superfinishing to form the  
6 rolling contact surface.

1 29. The process as claimed in claim 28, wherein the  
2 surface-hardening comprises carbonitriding.

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